Procedure for Certifying

Laboratory Fume Hoods

To Meet EPA Standards

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US Environmental Protection Agency
Safety, Health and Environmental Management Division
Technical Support and Evaluation Branch
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ACRONYMS

AAS	Auxiliary Air Supply
ADA	Americans with Disabilities Act
AEPG	*EPA Facilities Manual, Volume 1, Architecture, Engineering, and Planning Guide, 2/98*
AEREB	Architecture, Engineering and Real Estate Branch
AFV	Average Flow Velocity
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
CAV	Constant Air Volume
CFM	Cubic Feet Per Minute
EPA	Environmental Protection Agency
FMSD	Facilities Management and Services Division
FSHEMM	Facility Safety, Health and Environmental Management Manual
GFCI	Ground Fault Circuit Interrupter
HVAC	Heating, Ventilating, and Air Conditioning
IES	Institute for Environmental Sciences
LFH	Laboratory Fume Hood
LFPM	Linear Feet per Minute
LPM	Liters per Minute
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PPT	Pre-Purchase Performance Test
SEFA	Scientific Equipment & Furniture Association
SHEMD	Safety, Health and Environmental Management Division
VAV	Variable Air Volume

EXECUTIVE SUMMARY

This document outlines the procedure for ensuring that all EPA laboratory fume hoods comply with EPA and industry standards for construction, installation, and operation, to ensure a safe and healthful workplace and environment.

This document references and follows existing industry standards and practices for laboratory fume hood design, construction, operation and testing, with some modifications that apply to EPA-specific settings.

The procedures are organized into logical sections for construction, which defines design requirements; pre-purchase performance and newly installed testing, which defines the test that each hood must pass to be accepted by the EPA; and annual hood recertification requirements.

I. PURPOSE

This document outlines the certification of newly installed laboratory fume hoods (LFHs) in new or renovated facilities, and the test procedure to annually recertify LFHs in US Environmental Protection Agency (EPA) laboratories.

Figure 1 Laboratory Fume Hood Test Procedures

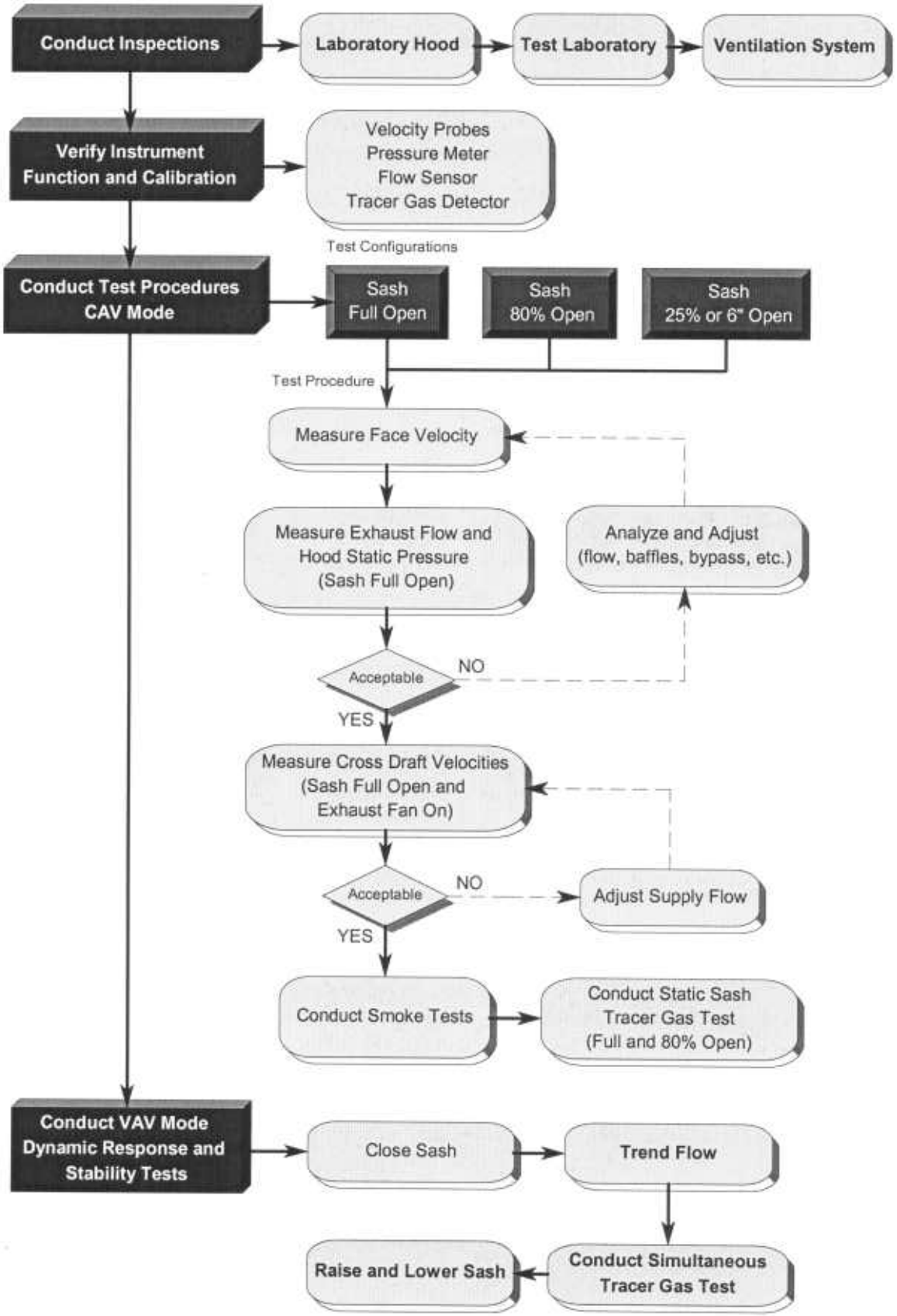
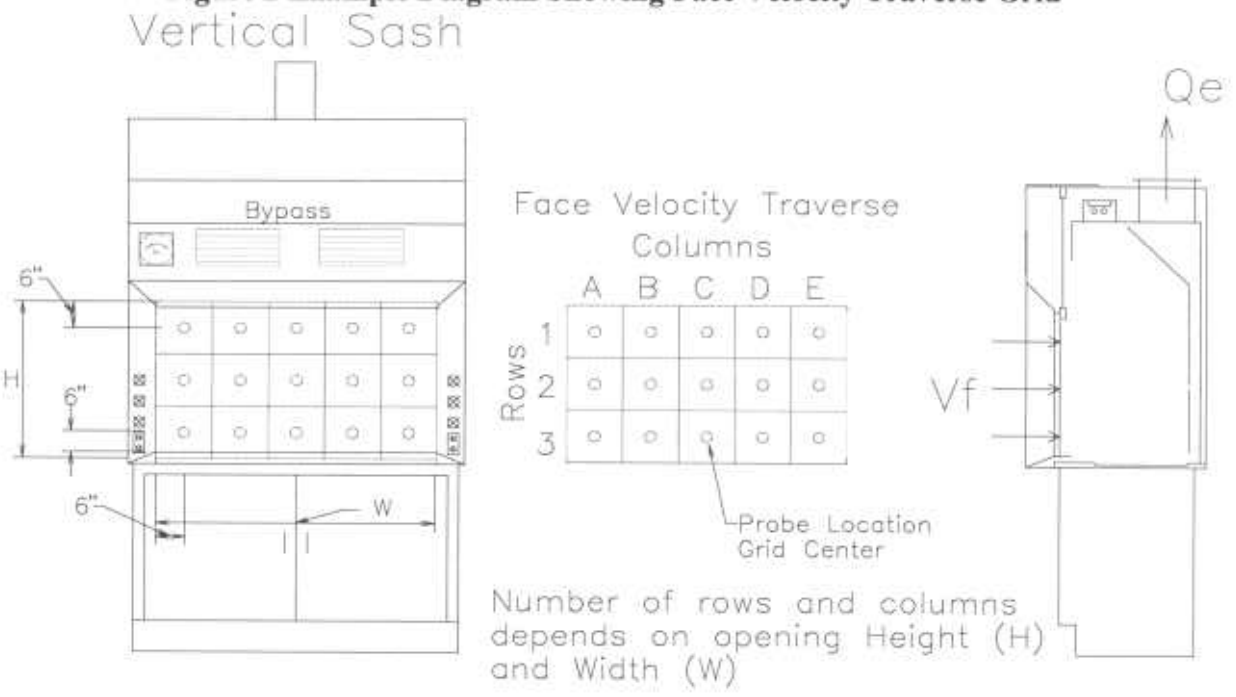
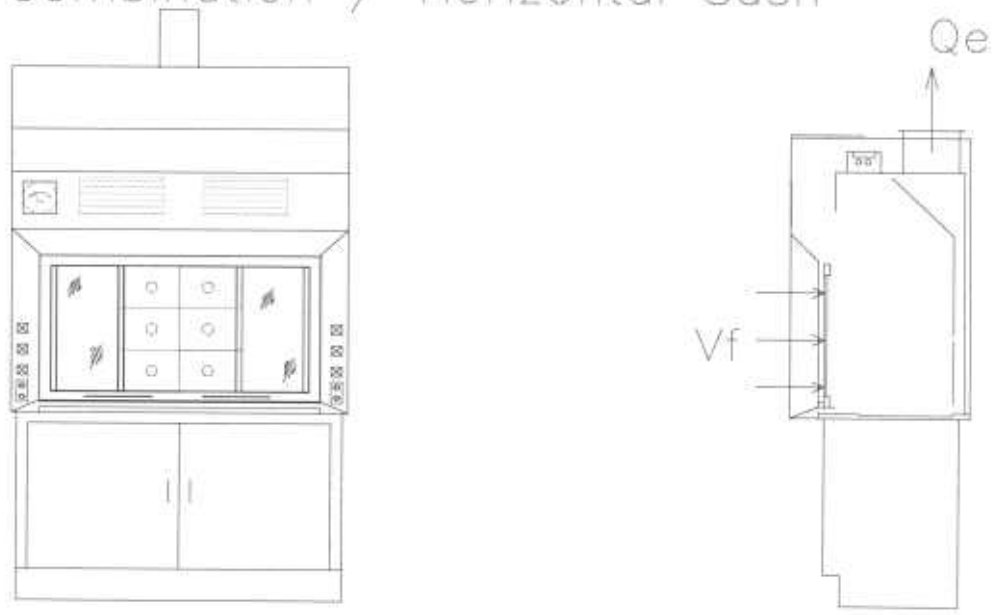


Figure 2 Example Diagram Showing Face Velocity Traverse Grid



H – Height from work surface to sash
W – Interior opening width in plane of sash
Vfavg = sum (Vfmean)/No. of Grids
Face Area = Af = L x W
Exhaust Flow = Qe >= Vfavg x Af



V. CERTIFICATION OF NEWLY INSTALLED LABORATORY FUME HOODS

The FSHEMM requires that after installation, fume hoods shall pass the EPA certification criteria as outlined in ANSI/ASHRAE 110 and SEFA 1-1, with the modifications specified by the EPA in this document, and in accordance with the criteria established in Tables 1 and 2. The "as installed" test shall be performed by the manufacturer in accordance with SHEMD's LFH certification guidelines. All such tests shall be performed in the presence of an EPA representative. The EPA has adopted, with modifications, the test procedures of SEFA1.1-1994, *Laboratory Fume Hoods Recommended Practices*, and ANSI/ASHRAE 110-1995. *Method of Testing Performance of Laboratory Fume Hoods.* Using SEFA 1.1-1994, follow the procedure described in Section 7. "Fume Hood Evaluation in the Field," with the following modifications.

A. Titanium tetrachloride smoke sticks with a 1-minute burn duration, a smoke gun, or a smoke generator are recognized smoke producing devices.

B. With the LFH exhaust fan turned on, cross drafts at the face of the hood shall be no more than 30 LFPM. Alternatively, cross drafts may be measured with the exhaust fan operating. In this case, take at least 20 airflow measurements over several minutes. The measurements shall be taken at the midpoint of the hood face opening, with the test instrument 12" to 18" away, and the operator positioned in a location that minimizes interference with the test.

C. The LFH AFV shall be 100 LFPM (-0 to +5 LFPM) with the sash at 80 percent open, and each individual measurement shall be within a tolerance of ±20 percent LFPM of the AFV. The hood shall be equipped with releasable sash stops at the 80 percent open position.

D. For face velocity measurements, divide the face open area into a grid, with the first lines set 6" away from the edges, and all other grid lines no further than 12" apart. If a distance of less than 12" is encountered, the remaining area shall be treated as if it were 12". It may prove helpful to place removable tape along the edges and to mark the grid lines on the tape. Take face velocity measurements and establish that the AFV with the sash 80 percent open is 100 LFPM with all readings within a tolerance of ±20 percent; otherwise, the airflow must be readjusted. Next, raise the sash to the fully open position, regrid the opening, and take face velocity measurements again. Verify that the AFV is 80 LFPM with all readings within a tolerance of ±20 percent; otherwise, the airflow must be readjusted.

E. For vertical laminar flow hoods, the flow visualization and face velocity tests shall be conducted with the vertical blower on, and again with it off. The LFH filter shall be leak-tested in accordance with NSF 49.

F. Check sash movement to determine whether it is smooth and in accordance with Section III.,P., of this document.

G. Verify proper air flow with a smoke stick, candle, or generator, as indicated.

H. Test the performance of LFH airflow alarms in accordance with the alarm manufacturer's recommendations.

Appendix A

U.S. EPA Laboratory Fume Hood Certification Data Sheets

U.S. EPA PRE-PURCHASE PERFORMANCE TEST CERTIFICATION/DATA SHEETS

LABORATORY FUME HOOD CONSTRUCTION CRITERIA

Manufacturer: _____
Address: _____
_____
_____ Zip Code: _____ _____

Hood Name/Model No: _____ Size:_____ Type:_____

Special Features or Specifications: _____

Name of Person Conducting Test: _____

Phone: _____ Fax:_____

HOOD TYPE			
Constant Volume Bypass Type (Except VAV hoods)			
Auxiliary Air Supply			
	Variable Air Volume	Radioactive Isotope	
	Perchloric Acid	Walk-In	
	Distillation	Vertical Laminar Flow	
	Biological Cabinet		

These construction criteria data sheets must be used in conjunction with the specifications in Section III of the EPA *Procedure for Certifying Laboratory Fume Hoods to Meet EPA Standards* under Section III, *Construction Criteria*.

HOOD CONSTRUCTION DATA ELEMENTS	COMMENTS
Suitability of Airfoil/Aerodynamic Entries	
Sidewall Thickness	
Interior Walls	
Baffle Type and Design	
Baffle Control Method, and Placement	
Light Fixture Type and Access Point and Foot Candles at work surface	

HOOD CONSTRUCTION DATA ELEMENTS	COMMENTS
Sash Design and Dimensions Does it move freely?	
Sash Stops: Present?	
Sash Sensor: Present?	
Exhaust Outlet: Appropriate?	
Electrical Switches: Type	
Work Surface Design and Dimensions	
Alarm Type and Settings	
Is a Multi-Speed Exhaust System Present?	
Hood: External Dimensions	
Hood: Interior Clear Working Height and Depth	
Sash Area: 80 Percent Open 100 Percent Open	
Any Special Construction Features?	

INSTRUMENTS AND EQUIPMENT			
Type of Tracer Gas			
Ejector System Type and Manufacturer			
Calibration Date			
Size of Critical Orifice			
Detector Type and Manufacturer			
Calibration Date			
Range, Accuracy, and Response Time			
Post Calibration Date			
Recorder Type and Accuracy			
Face Velocity Measuring Instruments: Type			
Manufacturer and Serial Number			
Range, Accuracy, and Calibration Date			
Smoke Generator: Type and Manufacturer			
Smoke Candle: Type and Manufacturer			

TEST ROOM CONDITIONS		
Airflow Control Settings and Calibration Date		
Temperature Control Settings and Calibration Date		

Supply Duct Traverse, Duct Dimensions:_____, Area:_____Sq Ft Location of Duct Traverse:_____

Record All Traverse Measurements, System Average Velocity:_____ FPM, Volume:____CFM

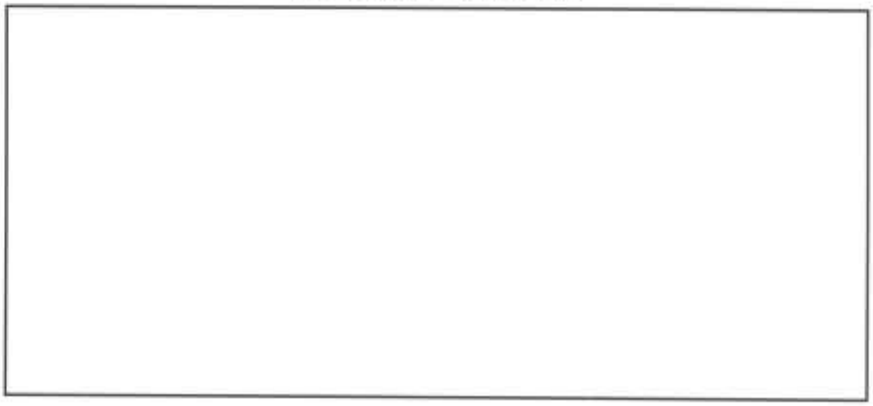
Exhaust Duct Traverse, Duct Size:_____ Area:_____ Sq. Ft.
Location of Duct Traverse:_____
Proximity to Control Valve:_____

Record All Traverse Measurements, System Velocity:____FPM, Volume:__CFM

Cross Drafts, With the sash fully open and the hood exhaust on, measure the air velocity at the center of the hoods' face opening 18" away from the hood: _____ FPM.
Test Room Static Pressure in Relation to Corridor: _____ Inches of Water.
Hood Volumetric Flow:_____ CFM, ANSI/ASHRAE 41.2-1987
Hood Static Pressure:_____" H_2O, ANSI/ASHRAE 41.3-1989

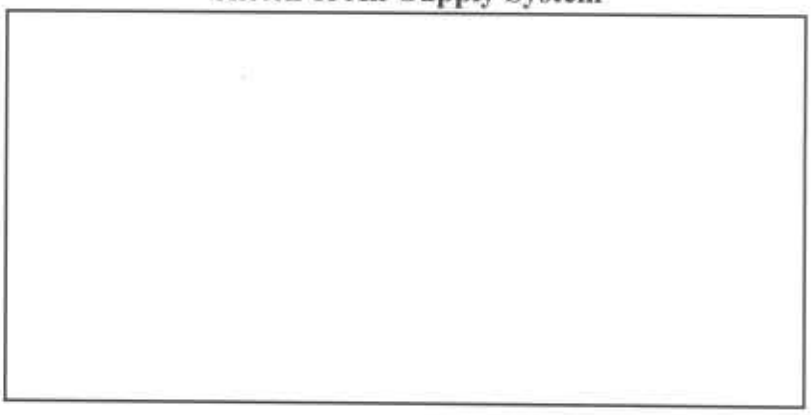
NOTES:

Sketch of Test Room



NOTES:

Sketch of Air Supply System



Type and Location of Supply Fixture (Grills, Registers, Ceiling Diffusers, Perforated Ceiling, Other):__

Other Activities in the Test Room:_____Other Hoods in the Test Room:_____

FLOW VISUALIZATION AND VELOCITY PROCEDURE	COMMENTS
Airfoil Sill Smoke Test @ 100 percent, then 80 percent Open: Acceptable?	
Fully Closed	
Along Sidewalls	
Behind Face	
Exterior, Top, Bottom, and Sides	
Interior, Reverse Airflow Test	
Large-Volume Smoke Test at 100 percent,80 percent Open, and Fully Closed	

Face Velocity with Sash 80 percent Open,
Size of Face Opening:_____Sq.Ft.

Record all measurements in LFPM for a 6' hood above.
Highest Reading:_____LFPM Lowest Reading: _____LFPM
Average Face Velocity: _____LFPM Volume:_____CFM

Face Velocity with Sash Fully Open, Size of Face Opening:_____ Sq. Ft.
Highest Reading: _____LFPM Lowest Reading: _____LFPM
Average Face Velocity:_____LFPM Volume: _____CFM

Face Velocity with Sash 6" Open, Size of Face Opening:_____Sq. Ft.

Highest Reading:_____LFPM Lowest Reading:_____LFPM
Average Face Velocity:_____LFPM Volume:_____CFM

Tracer Gas Test Procedure

Turn SF_6 detector on and verify that there is no background SF_6 in the test room:_____PPM
Detector Check:_____PPM

With the probe at the breathing zone of the mannequin and the ejector set to release 8 LPM located at the left position in the hood, record the detector readings every 10 seconds for 5 minutes:

Columns/ Minutes Across, Rows/ Seconds Down,

1	2	3	4	5

Average of readings:_____PPM

Move ejector and mannequin to center of hood, repeat above procedure:

Average of readings:_____PPM

Move mannequin and ejector to right position and repeat above procedure:

Average of readings:_____PPM
Average of all detector readings:_____PPM
Performance rating:_____AM_____, Hood Pass:_____, Hood Fail_____,

Remove mannequin, with SF_6 ejector emitting 8 LPM traverse the entire face opening with the detector's probe, record the readings below, 3 readings on the sides and 4 readings across the top and bottom:

	None Required Here	None Required Here	

Average of reading:_____PPM High:_____PPM Performance Rating _____Hood Pass/Fail:_____

Sash Movement Test Results: (Release rate of SF_6 shall be 8 LPM)
Results of First Cycle:_____PPM Results of Second Cycle:_____PPM Results of Third Cycle:_____PPM

Average of SME Tests:_____PPM, SME Performance Rating:_____SME-AM_____
SME-AM: Hood Passes:_____ Hood Fails:_____

Signature of Tester:_____ Print Name:_____
Signatures of Observers: _____

_____

_____

_____

_____

_____

COMMENTS/REMARKS

Appendix D

Relevant Standards Organizations

Relevant Standards Organizations

American Conference of Governmental Industrial Hygienists
1330 Kemper Meadow Drive
Cincinnati, OH 45240

American Industrial Hygiene Association
2700 Prosperity Drive
Fairfax, VA 22031

American National Standards Institute
11 West 42nd Street
New York, NY 10036

American Society of Heating, Refrigerating and Air Conditioning Engineers
1791 Tullie Circle, NE
Atlanta, GA 30329

Institute of Environmental Sciences
940 East Northwest Highway
Mount Prospect, IL 60056

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269

National Sanitation Foundation
3475 Plymouth Road
P.O. Box 130140
Ann Arbor, MI 48113